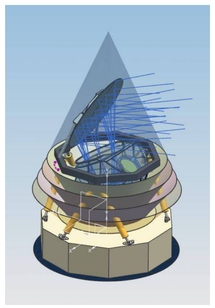
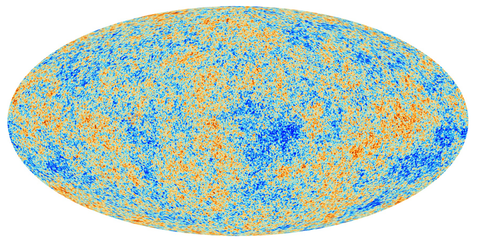


Make Larger

Probe of Inflation and Cosmic Origins: Optical Design and Sensitivity



K. Young[1], S. Hanany[1], Q. Wen[1], [2]person, [2]another person…

You need precise numbers throughout. Not ~

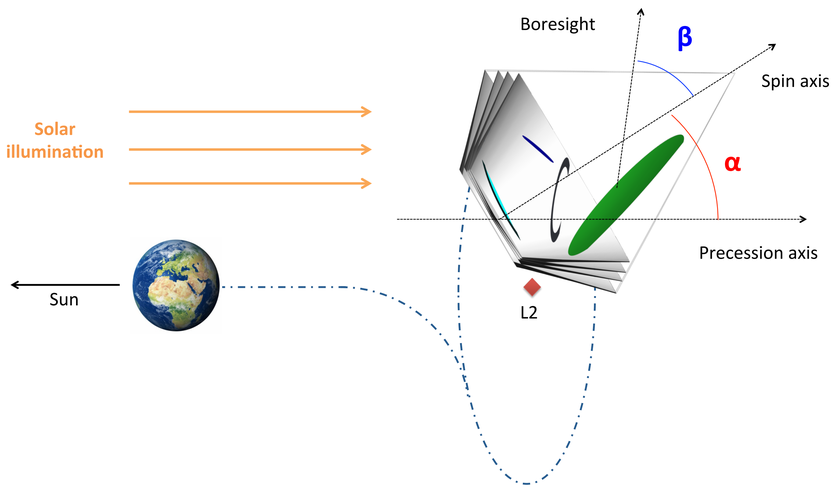
[1]School of Physics and Astronomy, University of Minnesota/Twin Cities, [2]affiliation

Scientific Observations

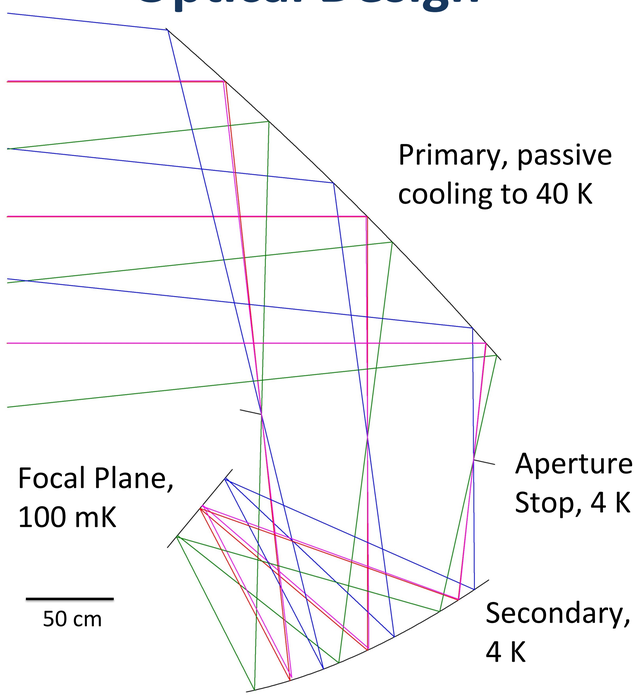
- Measure or set upper limits on primordial B-modes with $\sigma(r) \sim 10^{-5}$
- Determine the number of light relic particles, N_{eff}, to $\sigma(N_{eff}) < 0.03$
- Measure τ, the optical depth to reionization to cosmic variance limits, $\sigma(\tau) = 0.002$
  - Along with BAO observations, measures Σm_ν, the sum of neutrino masses, or sets an upper limit of 15 meV
- Map Galactic magnetic fields from large scales to 0.05 pc in nearby molecular clouds
- Map 1000s of protoclusters and clusters via the SZ effect
- Map the CIB and dusty infrared galaxies across the full sky

Instrument

- 70 times the polarization sensitivity of *Planck*
- 21 bands from 20 GHz to 800 GHz
- 12,356 polarization sensitive TES bolometers
- 1’ resolution at 800 GHz
- Full-sky coverage
- Mulitplexed readout,
  - FDM: x100 per pair of wires
  - TDM: 128 rows, 100 columns
- Launch vehicle is a Falcon 9, 4.6 meter fairing
- Precession and spin based scan strategy from L2 with $\alpha = 30°$, $\beta = 65°$

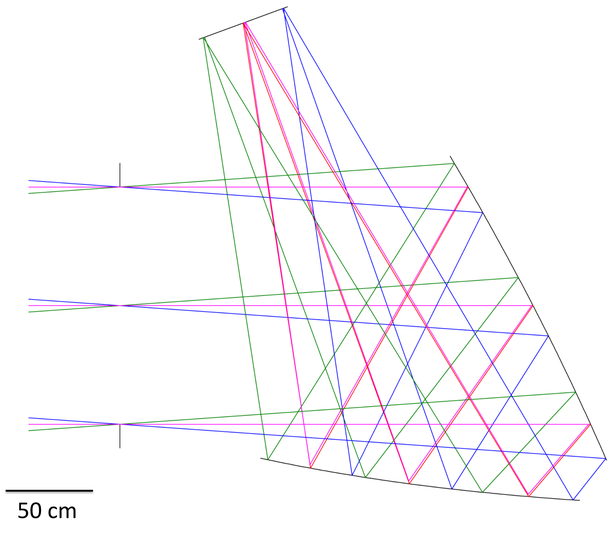


Optical Design



- 1.4 m Open Dragone, corrected to reduce coma [1]
- 18 x 12 degree field of view
- f/1.42 system gives compact focal plane

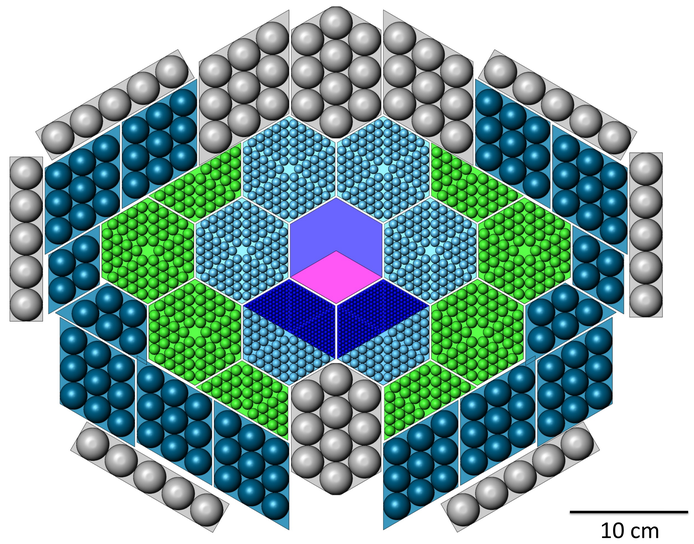
Alternative Design Considered

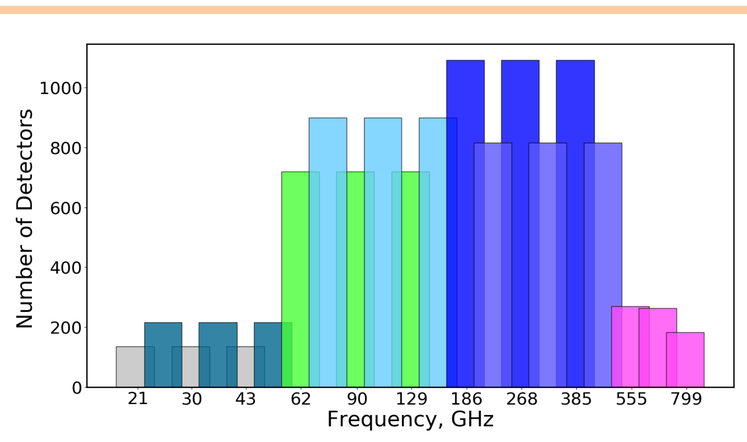


1.2 m Cross Dragone

- Larger, difficult to baffle sidelobes
- f/2.5 or greater increases focal plane size and mass
- Large secondary difficult to actively cool
- Lower optical aberrations

Focal Plane

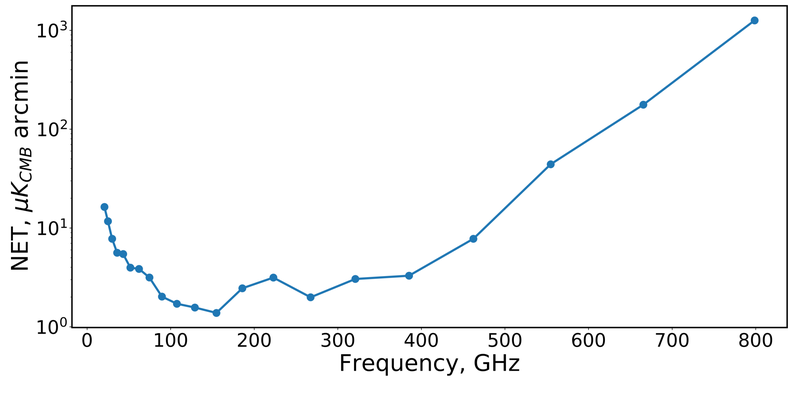




- Three color pixels, six polarization sensitive detectors per pixel

Sensitivity

- White noise only
- Includes photon (dominates), phonon, readout, and Johnson noise terms
- 4 year mission at 95% observing efficiency



- Total integrated map depth of 0.63 μK_{CMB} arcmin

References

[1] C. Dragone, "First-order correction of aberrations in Cassegrainian and Gregorian antennas," in IEEE Transactions on Antennas and Propagation, vol. 31, September 1983.